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REMARKS

In order to expedite prosecution of the above-identified application, claims 33-35 have been canceled without prejudice. Claim 1 has been amended to more particularly define Applicants' claimed invention. Support for the amendment of claim 1 can be found in original claims 2 and 4. Claims 2 and 4 have been canceled due to the incorporation of the subject matter thereof into claim 1.

The objection of the drawings under 37 CFR 1.83(a) is respectfully traversed. In view of the cancellation of claims 33-35, this rejection is deemed improper and should be withdrawn.

The objection to claims 33 and 35 because of informalities is respectfully traversed. In view of the cancellation of claims 33 and 35, this rejection is deemed improper and should be withdrawn.

At the outset, Applicants wish to direct the Examiner's attention to Applicants' discovery that by changing from the prior art turbulent inert gas shields to shields having at least an initial length of flow that is essentially laminar, the amount of mixing between the shield gas and the surrounding air (or other gaseous environment), as well as between the shield gas and the thermal spray effluent, is substantially reduced.

Another discovery by Applicants is a gas shield for thermal spraying that comprises a ring or sheath of combustion flames and combustion products that surrounds the effluent of the thermal spray device. This combustion flame shield substantially increases the useful range of standoff distances that can be employed in producing desired coatings. It is believed that this is accomplished, in part, because the amount of mixing between the shield gas and the surrounding air (or other gaseous environment), as well as between the shield gas and the thermal spray effluent is substantially reduced for much longer distances than with the state of the art shields.

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These discoveries decrease the rates at which the temperature and velocity of the spray effluent decrease with distance from the exit of the spray device. There are potentially several benefits that result from this. One of these benefits is that the standoff can be increased without diminishing the properties of the coating. A longer standoff allows more complex shapes to be coated, reduces the sensitivity of the coating to the angle of deposition, facilitates control of residual stress, allows more time to heat the powder particles, and may have other beneficial effects.

Applicants' claimed invention produces more laminar shield gas flows by increasing the viscosity of the shield gas. It is known that most normal gases, including those frequently used for shielding such as argon or nitrogen, have essentially the same viscosity at room temperature. Substantial increase in gas viscosity, however, can be obtained by heating the gas as required by Applicants' claimed invention.

Applicants direct the Examiner's attention to the working examples. A comparison is made of coatings produced using a plasma spray torch with the 24-hole flame ring described in Example 2 with those made using the same plasma spray torch with an ambient temperature inert gas shield. A designed experiment was carried out in which thermal barrier coatings with a CoNiCrAlY undercoat and zirconia topcoat were deposited under various conditions and evaluated for microstructural characteristics and thermal shock resistance. This experiment is described in detail in Example 3. It was found that the coatings produced with a flame shielded torch could be deposited at a very substantially greater standoff, had a much more consistent microstructure, were far less sensitive to angle of deposition, and had better thermal shock resistance than those deposited using the ambient temperature inert gas shielded torch. For example, the standoff using a specific torch was extended from a range of 1.25 to at most 1.5 inches with an ambient temperature inert gas shield to a range of 4 to greater than 6 inches.

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The rejection of claims 1, 3, 4, 7, 15, 16, 18-21, 30, 33 and 34 under 35 U.S.C. 102(b) as being anticipated by Rotolico et al. (US 4,964,568) is respectfully traversed.

In view of the amendment of independent claim 1 to incorporate the subject matter of non-rejected claim 2, this rejection is deemed improper and should be withdrawn.

The rejection of claims 2, 11-14, 17, 26-29, 31 and 32 under 35 U.S.C. 103(a) as being unpatentable over Rotolico et al. (US 4,964,568) is respectfully traversed.

Rotolico et al. is no different than the other turbulent gas shields of the prior art. Nowhere does Rotolico et al. disclose or suggest that by changing from turbulent gas shields to shields having at least an initial length of flow that is essentially laminar, the amount of mixing between the shield gas and the surrounding air (or other gaseous environment), as well as between the shield gas and the thermal spray effluent, is substantially reduced and the useful range of standoff distances that can be employed in producing desired coatings is substantially increased. Nowhere does Rotolico et al. disclose or suggest laminar shield gas flows, how to obtain laminar shield gas flows, and the benefits resulting from laminar shield gas flows as discovered by Applicants.

Applicants submit that alleged obviousness of the instantly claimed invention must be predicated on something more than it would have been obvious to try producing more laminar shield gas flows by increasing the viscosity of the shield gas by heating the shield gas to specified temperature to arrive at Applicants' claimed method for shielding the effluent of a thermal spray device or the possibility that such a particularly defined method for producing more laminar shield gas flows would have been considered in the future, having been neglected in the past. See Ex parte Argabright et al. 161 USPQ 703. It is submitted that "obvious to try" is not a valid test of patentability, and patentability

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determinations based on that as a test are contrary to statute. See In re Mercier 515 F2d 1161, 185 USPQ 774; In re Antonie 559 F2d 618, 195 USPQ 6; In re Goodwin et al. 576 F2d 375, 198 USPQ 1; and In re Tomlinson et al. 363 F2d 928, 150 USPQ 623.

Clearly, it is only by hindsight that the Examiner could impute to the turbulent gas shields of Rotolico et al., laminar shield gas flows by increasing the viscosity of the shield gas by heating the shield gas to specified temperature, to arrive at the instantly claimed method for shielding the effluent of a thermal spray device, and such hindsight obviousness after the invention has been made is not the proper test. See In re Carroll 601 F2d 1184, 202 USPQ 571.

The rejection of claims 5 and 35 under 35 U.S.C. 103(a) as being unpatentable over over Rotolico et al. (US 4,964,568) as applied to claims 1, 3, 4, 7, 15, 16, 18-21, 30, 33 and 34 and further in view of Nowotarski et al. (US 5,486,383) is respectfully traversed.

The primary reference Rotolico et al. is discussed above. The secondary reference, Nowotarski et al., adds nothing to make up for the deficiencies of Rotolico et al. as a primary reference. Nowotarski et al., like Rotolico et al., is silent with respect to laminar shield gas flows, how to obtain laminar shield gas flows, and the benefits resulting from laminar shield gas flows as discovered by Applicants.

In view of the amendment of independent claim 1, the cancellation of claim 35 and the above arguments, this rejection is deemed improper and should be withdrawn.

The rejection of claims 6, 8-10 and 22-25 under 35 U.S.C. 103(a) as being unpatentable over over Rotolico et al. (US 4,964,568) r in view of Nowotarski et al. (US 5,486,383) as applied to claims 5 and 35, and further in view of Taylor et al. (US 5,073,433) is respectfully traversed.

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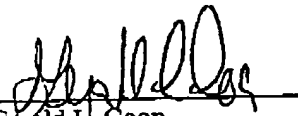
The primary reference, Rotolico et al., and the secondary reference, Nowotarski et al., are discussed above. The other secondary reference, Taylor et al., adds nothing to make up for the deficiencies of Rotolico et al. as a primary reference. Taylor et al., like Nowotarski et al. and Rotolico et al., is silent with respect to laminar shield gas flows, how to obtain laminar shield gas flows, and the benefits resulting from laminar shield gas flows as discovered by Applicants.

In view of the amendment of independent claim 1 and the above arguments, this rejection is deemed improper and should be withdrawn.

It is respectfully submitted that the rejections of record are improper and that the application is in condition for allowance. Accordingly, reconsideration and allowance of all claims are courteously solicited.

A response to the Office Action mailed October 22, 2004 was due January 22, 2005. Accordingly, submitted herewith is a petition for an extension of time for three (3) months. Please charge fees/surcharge which may be required by this paper, or credit any overpayment, to Deposit Account No. 16-2440.

Respectfully submitted,


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